

Claim 33, line 19, delete "resin coated molding sand" and substitute --heat insulating particulate material--.

Claim 34, line 20, delete "resin coated molding sand" and substitute --heat insulating particulate material--.

line 31, delete "connected" and substitute --connector--.

#### REMARKS

Claims 16, 18-20, 26-30 and 32-34 are pending in this application. Claims 28, 32 and 33 were previously allowed and the remaining claims stand rejected.

The applicants and their attorney would like to express there sincere appreciation to Examiner Scanlon for the courtesies extending during the personal interview conducted on February 8, 1989. The Examiner Interview Summary Record accurately reflects the discussion conducted during the interview.

The foregoing amendment to claim 34 (line 31) was made to overcome the rejection under 35 U.S.C. § 112 set forth in Paragraph 1 of the last Office Action. This amendment corrects an obvious typographical error and provides a clear antecedent basis. Accordingly, it is respectfully submitted that in view of this amendment to claim 34, this claim is now in condition for allowance and entry of this amendment to claim 34 is respectfully requested.

The other amendment to claim 34 (line 20) and the amendments to previously allowed claims 28 and 33 have been made to slightly broaden these claims with respect to the material which is inserted within the probe. As originally filed in these claims, the material recited was "resin coated molding sand." However, in the specification, resin coated molding sand was provided as one example of a type of material which could be employed, the broader class of material being loosely packed heat insulating particulate material. This feature of these claims did not appear to be the basis for allowance and, therefore, the amendment to these claims should not in any way affect allowability. The mistake made in not claiming the broader material was only recently brought to the attention of the applicants' attorney when the allowed claims were being reviewed for possible issuance of the patent. Accordingly, entry of the amendment to these claims is respectfully requested.

Claims 16, 18 and 20 have been amended in order to more clearly point out and distinctly claim the aspect of the applicants' invention pertaining to the structure of the refractory sheath. More particularly, these claims have been amended to make it abundantly clear that the generally annular sheath has a first thickness at one end and that this thickness tapers down or diminishes toward the immersion end of the probe so that a minimum thickness of the sheath is presented at the immersion end, thereby minimizing the overall cross-sectional area

of the probe at the immersion end for the purpose of minimizing trapped gases adjacent to the measuring element.

All three of these independent claims (16, 18 and 20) were rejected in the last Office Action as being unpatentable over the combination of Jackson in view of Engell et al. and further in view of Norburn. At Paragraph 7 of the Office Action, the Examiner indicated that the features presented in the arguments set forth in response to the prior Office Action which distinguish over these references were not clearly set forth in the claims. The foregoing amendment to these three independent claims is believed to now clearly set forth the structural distinctions discussed in detail in the response to the prior Office Action. During the interview, the Examiner reviewed the proposed claim language and indicated that the claims, as amended, appear to overcome the rejection. Accordingly, it is respectfully requested that the foregoing amendment to these claims be entered since they will place these claims, perhaps, in condition for allowance. Moreover, in the event that claims are not placed in condition for allowance, they will place the claims in better form for subsequent action, such as an appeal.

In the last Office Action and in the interview, the Examiner indicated that amending claims 16, 18 and 20 in the manner set forth above may raise new issues after final. More specifically, the Examiner was concerned that other references of record, specifically, the Shearman patent, Soviet Patent 144,620

and German Patent 1,928,845 showed tapered sheets of diminishing thickness. The applicants have reviewed the references identified by the Examiner, as well as the other references of record, and, for the reasons set forth in detail below, respectfully submit that claims 16, 18 and 20, as amended above, distinguish patentably over all such references, whether taken alone or in combination.

1. U.S. Patent No. 3,610,045 - Shearman.

The Shearman patent discloses a temperature measuring device for use with a bed of molten metal. The device is designed to be permanently installed at an appropriate location within the side wall (12) of a metal furnace. While the thermocouple element (16), in one embodiment, is surrounded by an outer protective sheath (21) having a generally conical shape, the remainder of the structure of the temperature measuring device is quite different from the structure set forth in the applicants' independent claims.

It is important to note that a temperature measuring device, such as that of Shearman, which is permanently installed with the horizontal orientation shown in the Shearman patent, is very much different from that of a probe (such as claimed by applicants) which is adapted to be temporarily installed into a molten metal bath from above with a generally vertical orientation. As described in response to the prior Office Action,

gases are given off by the thermocouple element reacting with the metal within the molten metal bath. In the typical probe orientation with the immersion end extending downwardly, it is important that the probe be tapered in order to facilitate movement of the oxygen or other trapped gases away from the thermocouple element as the gases rise through the molten metal. Clearly, no such problem is recognized or presented by the Shearman patent. Moreover, the orientation of the Shearman temperature measuring device is inconsistent with the removal of any gases which may be formed around the temperature probe. In addition, since the Shearman temperature probe appears to be fully enclosed by the outer sheath, it is respectfully submitted that gases of this type (usually generated by the temperature sensing element interacting with the molten metal) are probably not present with respect to use of the Shearman device. Accordingly, it is believed that the applicants' invention, as set forth in the independent claims discussed above, distinguishes patentably over the Shearman patent.

## 2. German Patent 1,928,845

No translation of the German patent is presently available. However, from Fig. 1, it appears as though the patent relates to a probe which includes an outer sheath (7) which is tapered toward the immersion end. The manner in which the sheath is tapered is different from that of the applicants' sheath in

that both the inner diameter and the outer diameter are tapered toward a generally flat annular shoulder which extends outwardly from the probe body. An additional annular member (6) extends beyond the outer sheath towards the immersion end and forms an additional radially outwardly extending annular shoulder closer to the measuring element (5). Thus, neither the outer sheath (7) nor the additional element (6) tapers down to a minimum thickness proximate the measuring element to avoid trapping gases proximate to the measuring element. It appears as though the German patent in no way recognizes the problem which the applicants' invention overcomes, and that one skilled in the art would not look to the German patent for a solution to the problem addressed by the applicants. Moreover, it is respectfully submitted that the structure of the German probe is quite different from that of the applicants' probe as set forth in the independent claims.

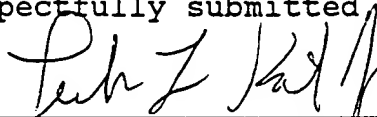
### 3. Russian Patent 144,620

Although an English translation of this patent is not presently available, it appears as though the outer sheath (5) of the Russian probe does not taper down to a minimum cross-sectional thickness. Instead, while it does slightly taper, a radially outwardly extending annular shoulder of approximately one-half of the overall wall thickness of the outer sheath remains proximate the measuring element. A shoulder of this type could disrupt the flow of gases away from the measuring element. Accordingly, it is

respectfully submitted that the Russian patent does not recognize the problem recognized by the applicants and, therefore, cannot be said to provide any significant teaching which would lead or suggest to one skilled in the art to utilize the Russian structure to overcome the problem addressed by the applicants. Accordingly, it is respectfully submitted that the applicants' invention, as set forth in the independent claims, distinguishes patentably over the Russian patent.

The applicants have reviewed the remaining references of record and believe that all of these references can also be distinguished for substantially the same reasons. Accordingly, it is respectfully submitted that the present application, including claims 16, 18-20, 26-30 and 32-34, is in condition for allowance and such action is respectfully solicited.

Respectfully submitted,



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